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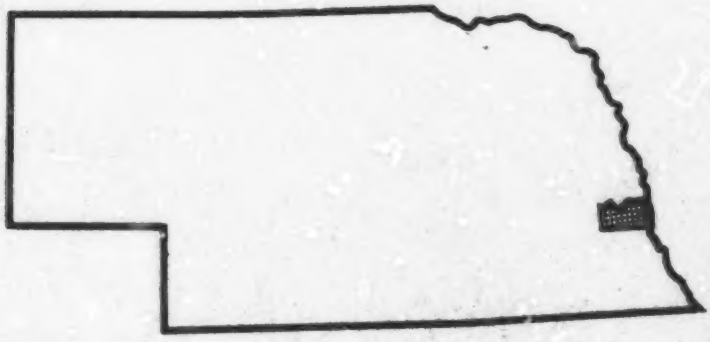
FLOOD INSURANCE STUDY

ORIGINAL

COUNTY OF CASS, NEBRASKA

UNINCORPORATED AREAS



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MAY 19, 1987

Federal Emergency Management Agency

COMMUNITY NUMBER - 310407

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Flood Boundary and Floodway Map Index
Flood Boundary and Floodway Map

PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map

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NOTICE TO
FLOOD INSURANCE STUDY USERS

Individual components of this Flood Insurance Study (i.e., text, tables, profiles, and maps) are all subject to revision as additional data become available. Because revised components may be issued separately, study users should consult the community map repository for those components that are currently effective.

In cases where this Flood Insurance Study and any components thereof warrant revision, a Revisions Description section may be incorporated into this text. When applicable, study users should refer to the Revisions Description to obtain pertinent data and information concerning revisions.

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FLOOD INSURANCE STUDY

COUNTY OF CASS, NEBRASKA
UNINCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Unincorporated Areas of Cass County, Nebraska, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the Unincorporated Areas of Cass County to the regular program of flood insurance by the Federal Emergency Management Agency (FEMA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.3 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by Hoskins-Western-Sonderegger, Inc. for the Federal Emergency Management Agency, under Contract No. H-3999. This study was completed in September 1978.

1.3 Coordination

In the initial phases of this study, contacts were made with the U.S. Geological Survey (USGS), the Nebraska Natural Resources Commission, the Soil Conservation Service (SCS), and the U.S. Army Corps of Engineers (COE). These contacts were made for the purpose of obtaining information on any existing studies dealing with flood problems in Cass County. Throughout the period of study, hydrologic and hydraulic analyses of the Platte River were coordinated with the COE.

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Determination of unincorporated areas to be studied was made at an initial coordination meeting held April 2, 1976. Representatives of Cass County, FEMA, the Nebraska Natural Resources Commission, and the Study Contractor were present at this meeting. Anticipated future development and past flooding problems in these areas were also discussed at this meeting. The decision to study the entire south bank of the Platte River within Cass County was made at a meeting held April 29, 1976, at which representatives of the Nebraska Natural Resources Commission and the Study Contractor were present.

On September 15, 1981, the results of the work by the Study Contractor were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, FEMA, and the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the unincorporated areas of Cass County, Nebraska. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction through September 1983. The scope and methods of study were proposed to and agreed upon by FEMA and the unincorporated areas of Cass County.

The flooding sources studied by detailed methods are listed below:

a. The Missouri River for its entire reach in Cass County; including the Wa-Con-Da Lake area; and

b. The Platte River for its entire reach in Cass County.

2.2 Community Description

Cass County is located in east-central Nebraska, and is bordered by the Missouri River and unincorporated areas of Mills and Fremont Counties in Iowa to the east, the Platte River and unincorporated areas of Sarpy and Saunders Counties to the north, Lancaster County to the west, and Otoe County to the south. The population of Cass County was 18,076 in 1970 (Reference 1).

The climate of the Cass County area is characterized by cold winters and hot summers. Average annual precipitation is approximately 32 inches. The topography of the area is characterized by a flat valley bordered by steep bluffs. Areas adjacent to the flood plain are characterized by rolling hills of loess soils overlying glacial drift. Vegetation in the area consists primarily of agricultural crops. Some trees are present along the banks of the river.

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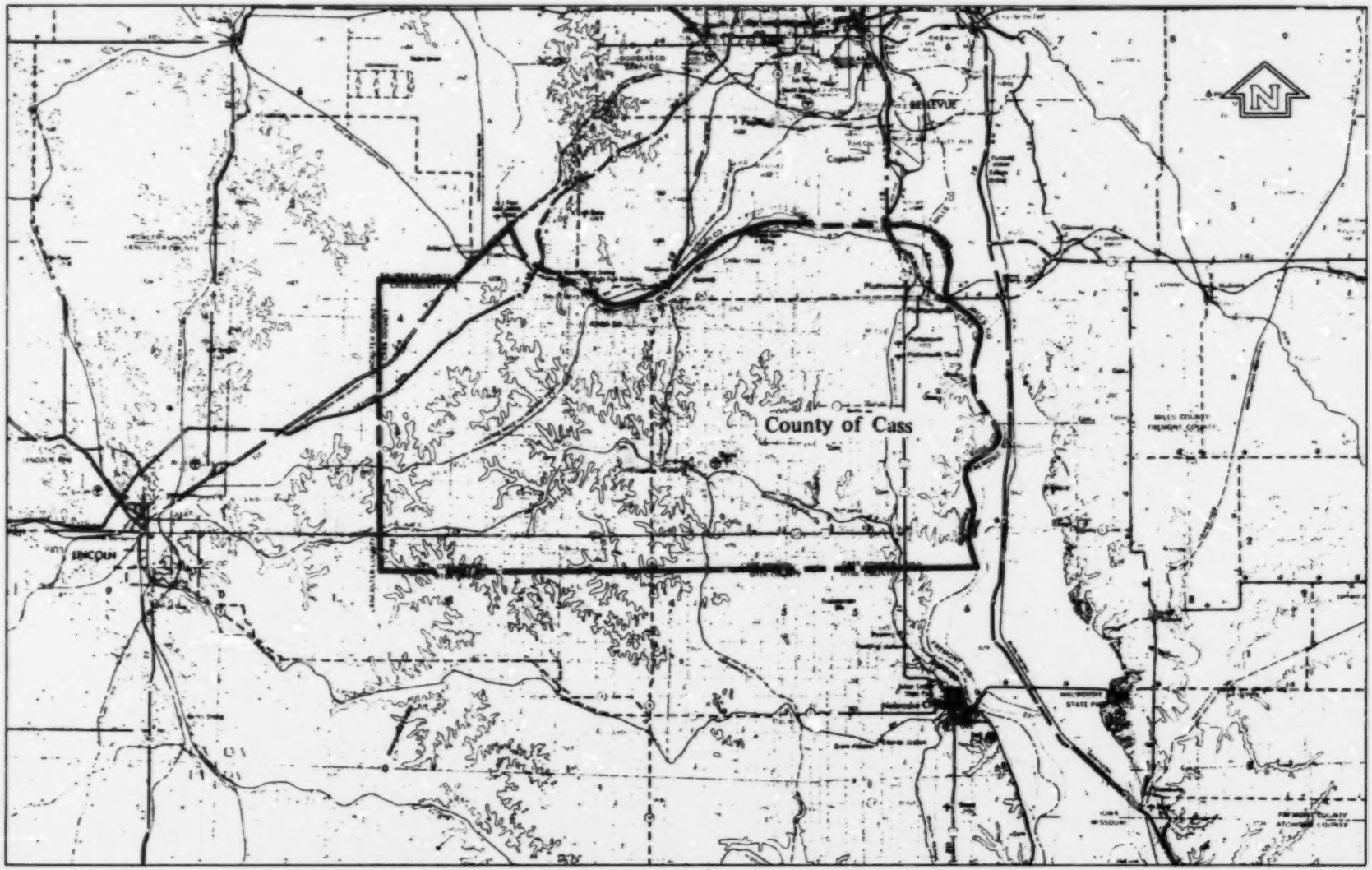

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF CASS, NE
(UNINCORPORATED AREAS)

APPROXIMATE SCALE

8 0 8 16 24 MILES

VICINITY MAP

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The Platte River drains an area of approximately 90,000 square miles of southeastern Wyoming, northeastern Colorado, and Nebraska. Elevations range from over 13,000 feet in the mountainous headwaters of the basin to approximately 960 feet at the confluence with the Missouri River. In the Cass County vicinity, the Platte River is a broad, shallow stream. Typical flows range from several cubic feet per second (cfs) to several thousand cfs. Flood flows may be greater than 100,000 cfs (Reference 2).

Wa-Con-Da Lake is an unincorporated residential and recreational development located in the southeast corner of Cass County in southeastern Nebraska. The lake is an old river channel, lying within the Missouri River flood plain. There is residential development around almost the entire perimeter of the lake. The Missouri River flood plain in the Wa-Con-Da Lake area is a broad, flat valley ranging in width from approximately three to seven miles. The natural features of the Missouri River basin upstream of the Wa-Con-Da Lake area vary widely because of the tremendous size of the basin and the large elevation difference between the headwaters and the Wa-Con-Da Lake area.

Some development in South Bend, Louisville, and Cedar Creek is located in the Platte River flood plain. This includes residential, commercial, and industrial development. Flood plain development in the unincorporated areas includes residential and recreational developments, such as Horseshoe Lake, and commercial development, such as limestone quarries and gravel pits. Flood plain development, especially residential and recreational, is continually increasing in the study area.

2.3 Principal Flood Problems

The flood of record on the Platte River in Cass County is the flood of March 1960. The cause of this flood was rapid snowmelt runoff aggravated by ice jams. The peak discharge recorded for this flood at South Bend was 124,000 cfs. The return period for a flow of this magnitude is approximately 25 years (Reference 3). A major flood also occurred on the Platte River in March 1978, which resulted from rapid snowmelt and ice jams. The recorded peak discharge was 110,000 cfs. Damage resulting from these floods varied according to the location and severity of the ice jams. Other major floods on the Platte River have occurred in the years 1944, 1948, 1949, 1950, 1957, 1962, 1963, 1964, 1967, and 1971 (References 2, 3 and 4).

The major factor that aggravates flooding along the Platte River is ice jamming. Almost all of the major floods listed above were caused by rapid snowmelt runoff and ice jams, which result from the rapid breakup of river sheet ice. The amount of sheet ice present depends on the degree and duration of cold weather. It is not uncommon for the Platte River to freeze to the bottom of the channel. If the breakup of the sheet ice occurs rapidly and clogs the river channel, water is forced out of the banks and into the surrounding flood plain areas (Reference 2).

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Flooding from the Platte River may also be aggravated by levees and by roads and railroad tracks that act as levees. Floodwaters overtopping levees are prevented from returning to the channel, thus prolonging the effects of the flooding in areas behind the levees.

The Missouri River historically has been a flooding problem in Cass County. The largest flood of record in Cass County on the Missouri River is the flood of April 1952. This flood had a peak discharge of approximately 400,000 cfs (Reference 4). The recurrence interval of a flood of this magnitude is greater than 500 years. Since 1954, construction of six Missouri River main stem dams in the Dakotas and Montana have significantly reduced the peak discharges on the Missouri River. However, flooding can still occur from runoff downstream of the dams sometimes aggravated by ice conditions on the river (Reference 5).

Development in the Wa-Con-Da Lake area has all taken place within the past 20 years. Since development of the lake began, flooding has occurred only in the years 1967 and 1969. In both years, only parts of the developed area were flooded. The 1969 flooding occurred because the levee surrounding the lake was not yet completed. Since completion of the levee, no flood damage has been incurred.

The only flooding source of concern to the Wa-Con-Da Lake area is the Missouri River.

2.4 Flood Protection Measures

Flooding from the Platte River is controlled, to some extent, by several upstream reservoirs in Colorado, Wyoming, and Nebraska. The effect of these reservoirs is included in the discharge-frequency relationship derived for the Platte River. A small amount of flood protection is also provided by private levees along the river. These levees vary considerably in flood protection capability.

Flooding from the Missouri River is controlled by several dams and reservoirs located in the Missouri River basin upstream of Cass County. The six major dams and reservoirs located on the Missouri main stem are listed in the following table (Reference 5).

Missouri River Dams

Dams	Drainage Area (square miles)	Location	Year Operational
Fort Peck	57,500	Fort Peck, Montana	1940
Garrison	181,400	Riverdale, North Dakota	1955
Oahe	243,500	Pierre, South Dakota	1962
Big Bend	249,300	Fort Thompson, South Dakota	1964
Fort Randall	263,500	Pickstown, South Dakota	1953
Gavins Point	279,500	Yankton, South Dakota	1955

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The influence of these dams is reflected in the discharge-frequency relationships which have been developed for the Missouri River. A series of Federal and private levees are located on the Missouri River. The Federal levees are located on the east bank of the Missouri, thereby, providing flood protection for the side of the river opposite Cass County. The private levees vary considerably in flood protection capability, and no levee system protects Cass County from the 100-year flood.

Wa-Con-Da Lake is surrounded by a flood control levee constructed in 1968 and 1969. No flood damage has been incurred at Wa-Con-Da Lake since completion of the levee.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50-year period is about 40 percent (four in ten), and for any 90-year period, the risk increases to about 60 percent (six in ten). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail affecting the community.

The peak discharge-frequency relationship for the Platte River was developed for the Platte River Basin, Nebraska, Level B Study (Reference 3). The relationships determined in the Level B Study were developed from recorded peak discharges at USGS gaging stations on the Platte River at North Bend (gage No. 06796000), Ashland (gage No. 06801000) and South Bend (gage No. 06805500), Nebraska. These gaging stations had 25-, 26-, and 20-year periods of record, respectively. Regional adjustment of mean discharge, standard deviation, and skew, and the log-Pearson Type III probability distribution were used to statistically analyze the recorded peak discharges (Reference 3). The 500-year peak discharge was determined by extrapolation of the calculated frequency curve.

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Peak discharge-frequency relationships for the Missouri River have been developed by the COE, based on an analysis of gaged flows on the Missouri River. The relationships reflect the influence of the many upstream dams and reservoirs on the river.

The discharge-probability relationships for the Missouri River at Omaha are based upon the Missouri River Agricultural Levee Restudy Program - Hydrology Report prepared by the COE (Reference 6). Eight gaging stations on the main stem of the Missouri River, one of them located just downstream from the Interstate Highway 480 bridge in Omaha, were the principle sources of data for defining these relationships. Stage records from the years 1898 to 1929, and stage-discharge records from the years 1929 to 1960 were used in the study. Stage values which were available for each of the gaging stations prior to 1929 were converted to discharge values by appropriate rating curves. The study of main stem reservoir effects on daily discharge hydrographs was limited to the period subsequent to 1930 when extensive gaging of tributary streams began. Eleven representative hydrographs were selected for each of the eight main stem gaging stations. The representative hydrographs used for the Omaha station were from the years 1932, 1939, 1941, 1942, 1948, 1950, 1951, 1954, 1956, 1958, and 1960. To develop a frequency-discharge relationship, the reservoir-modified annual flood peaks of the eleven representative hydrograph years were plotted in descending order. Eye-fit curves were drawn using the plotted points as guides, giving appropriate consideration to the consistency of the reservoir effects.

Peak discharges for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
MISSOURI RIVER At Plattsmouth	413,800	160,000	200,000	220,000	265,000
PLATTE RIVER At mouth	90,000	93,000	150,000	180,000	270,000

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3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the streams in the community were carried out to provide estimates of the elevations of the floods of the selected recurrence intervals along each flooding source studied in detail.

Cross section data for the Platte River from the mouth to the Village of Louisville were taken from a 1975 Platte River flood plain study by the Nebraska Natural Resources Commission (Reference 7). Cross section data upstream of Louisville were determined by photogrammetric methods utilizing aerial photographs taken in 1976 (Reference 8). Cross section data for the Missouri River were obtained by photogrammetric methods (Reference 9).

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles. For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map.

Roughness coefficients (Mannings "n") were determined for the Platte River by the COE. The coefficients were calibrated to match high water marks and stream gaging station rating curves. Roughness coefficients ranged from 0.019-0.036 for the channel and from 0.050 to 0.100 for the overbank areas (Reference 2). Roughness coefficients for the Missouri River were determined by the COE and ranged from 0.019 to 0.028 for the channel and from .035 to .190 for the overbank areas.

The starting water-surface elevations for the Platte River were determined from stage-discharge relationships developed for the Missouri River at the mouth of the Platte River (Reference 2). Starting water-surface elevations were based on downstream backwater computations (Reference 10). Water-surface profiles were determined using the COE HEC-2 backwater computer program (Reference 11). Flood profiles were drawn showing water-surface elevations for floods of the selected recurrence intervals.

Hydraulic analyses on the Missouri River were conducted by the COE, Omaha District, as part of the Special Flood Hazard Information Study for the Missouri River (Reference 5). Starting water-surface elevations and runoff coefficients were determined by the COE, and are contained in the Special Flood Hazard Information Study (Reference 5).

Hydraulic modeling procedures for this study were coordinated with the 1975 Natural Resources Commission flood plain study (Reference 7) and the Sarpy County Flood Insurance Study (Reference 2). Downstream of Louisville, the procedures developed for the 1975 Natural Resources Commission study, with minor modifications, were used. Upstream of Louisville, the procedures developed for the Sarpy County study were used. In accordance with the Sarpy County study, all levees along the Platte River upstream from U.S. Highways 73 and 75 were considered to fail during the 100-year flood.

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The hydraulic analyses for this study are based only on the effects of unobstructed flow. The flood elevations as shown on the profiles are, therefore, considered valid only if hydraulic structures, in general, remain unobstructed and if channel and overbank conditions remain essentially the same as ascertained during this study.

All elevations are referenced from National Geodetic Vertical Datum of 1929 (NGVD); elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by FEMA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100-year and the 500-year floods have been delineated using the elevations determined at each cross section; between cross sections the boundaries were interpolated using topographic maps. Downstream of Louisville, USGS quadrangle maps enlarged to a scale of 1:12000 were used (Reference 12). Upstream of Louisville, topographic mapping at a scale of 1:4800, with four-foot contour intervals was used (Reference 13). On the Missouri River, topograhic maps with a scale of 1:4800 and a contour interval of four feet (Reference 14) were used. The boundaries for approximate areas were delineated directly from the Flood Hazard Boundary Map (Reference 15). Flood boundaries were terminated at all tributaries not studied by either detailed or approximate methods with limit-of-study lines, rather than by closing of the flood boundaries. This was done to avoid misinterpretation of flooding hazards from these tributaries.

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map. Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to lack of detailed topographical information or to limitations of the map scale, such areas are not shown. In cases where the 100-year and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

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4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of FEMA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced.

The Platte River floodway analysis was coordinated with the 1975 Natural Resources Commission flood plain study (Reference 7) and the Sarpy County Flood Insurance Study (Reference 2). The floodway boundary was determined on the basis of equal conveyance reduction from each side of the 100-year flood plain. Final adjustments were made by specifying encroachment stations to eliminate undulations and to prohibit the floodway boundary from encroaching into the natural river channel. The floodway boundary for the Missouri River was determined using COE preliminary guidelines for the delineation of floodway limits on the Missouri River. These preliminary guidelines, established in October 1976, propose that, in the absence of Federal levees, the floodway boundaries be established on the basis of equal conveyance reduction from each side of the flood plain with the 1.0 foot maximum flood height increase, except that the minimum floodway width shall be 3,000 feet (Reference 16). Floodway widths for the Platte and Missouri Rivers extend beyond the county boundaries.

The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 2).

As shown on the Flood Boundary and Floodway Map, the floodway boundaries were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE
PLATTE RIVER							
A	4000	5044	59,555	3.0	968.3	967.3	1.0
B	8000	5689	62,590	2.9	969.2	968.2	1.0
C	11,800	4251	43,947	4.1	970.0	969.2	0.8
D	16,150	1667	23,637	7.8	974.2	973.8	0.4
E	18,100	1867	26,687	6.7	975.7	974.9	0.8
F	20,400	1889	25,219	7.1	977.6	976.6	1.0
G	26,500	1791	25,359	7.1	980.5	980.0	0.5
H	29,500	4208	33,701	5.3	983.1	982.4	0.7
I	37,700	1861	25,300	7.1	989.2	988.7	0.5
J	40,300	1302	21 201	8.5	991.1	990.7	0.4
K	43,100	2201	28,144	6.4	993.5	992.9	0.6
L	45,950	2233	34,016	5.3	995.5	994.7	0.8
M	48,800	2104	27,549	6.5	996.8	996.2	0.6
N	51,800	2427	33,191	5.4	998.3	997.5	0.8
O	55,500	2660	27,031	6.7	1000.2	999.5	0.7
P	79,600	3121	29,399	6.1	1017.5	1017.3	0.2
Q	82,800	2529	28,412	6.3	1020.0	1019.7	0.3
R	96,440	2120	22,190	8.1	1028.4	1027.7	0.7
S	97,320	2100	21,917	8.2	1028.8	1028.3	0.5

[1]FEET ABOVE CONFLUENCE WITH MISSOURI RIVER
[2]THIS WIDTH EXTENDS WITHIN SARPY COUNTY

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF CASS, NE
(UNINCORPORATED AREAS)

FLOODWAY DATA

PLATTE RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE
PLATTE RIVER							
T	98,260	1812	19,034	9.5	1029.3	1028.8	0.5
U	99,270	1680	17,589	10.2	1029.9	1029.5	0.4
V	100,750	2000	22,074	8.2	1031.7	1030.9	0.8
W	102,150	1845	19,252	9.3	1032.4	1031.6	0.8
X	103,800	1786	18,776	9.6	1033.5	1032.8	0.7
Y	105,500	2118	19,185	9.4	1034.7	1034.1	0.6
Z	106,870	1897	18,675	9.6	1036.1	1035.3	0.8
AA	108,750	1899	21,606	8.3	1038.1	1037.2	0.9
AB	110,140	2080	23,209	7.8	1039.4	1038.8	0.6
AC	114,130	1602	18,873	9.5	1042.2	1041.8	0.4
AD	115,650	2043	23,742	7.6	1043.6	1043.3	0.3
AE	116,420	2342	25,420	7.1	1044.1	1043.7	0.4
AF	117,350	2582	25,401	7.1	1044.5	1044.2	0.3
AG	118,100	2533	25,842	7.0	1044.8	1044.5	0.3
AH	119,280	2224	21,440	8.4	1045.2	1044.9	0.3
AI	120,550	2081	20,157	8.9	1046.0	1045.7	0.3
AJ	122,210	1850	17,570	10.2	1047.2	1046.8	0.4
AK	123,320	1777	16,044	11.2	1048.2	1048.0	0.2
AL	124,560	2525	24,571	7.3	1050.4	1049.9	0.5
AM	126,130	2622	26,996	6.7	1051.6	1050.8	0.8
AN	127,720	2875	27,347	6.6	1052.6	1051.6	1.0
AO	129,110	1862	20,713	8.7	1053.0	1052.1	0.9
AP	130,230	1581	16,158	11.1	1053.5	1052.7	0.8
AQ	131,840	2322	31,666	5.7	1056.6	1055.8	0.8
AR	134,030	3020	30,699	5.9	1057.1	1056.3	0.8
AS	135,350	3164	30,953	5.8	1057.6	1056.9	0.7
AT	137,170	4060	30,850	5.2	1058.5	1057.6	0.9
AU	138,850	4518	38,569	4.1	1059.3	1058.5	0.8

[1]FEET ABOVE CONFLUENCE WITH MISSOURI RIVER
[2]THIS WIDTH EXTENDS WITHIN SARPY COUNTY

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TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF CASS, NE
(UNINCORPORATED AREAS)

FLOODWAY DATA

PLATTE RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	WITH FLOODWAY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	DIFFERENCE (FEET)
MISSOURI RIVER							
A	571.30	5302[2]	66,653	3.3	940.1	939.8	0.3
B	572.30	6138[3]	61,315	3.6	941.0	940.2	0.8
C	573.27	4909[3]	60,877	3.6	942.4	941.5	0.9
D	574.21	3162[3]	41,854	5.3	943.2	942.3	0.9
E	575.19	5702[3]	68,313	3.2	945.1	944.5	0.6
F	575.84	6021[3]	61,573	3.6	945.6	945.3	0.3
G	576.41	6661[3]	70,975	3.1	946.4	945.9	0.5
H	576.75	5384[3]	59,429	3.7	946.6	946.1	0.5
I	577.32	5417[3]	61,641	3.6	947.2	946.4	0.8
J	577.75	6234[3]	75,496	2.9	947.9	947.1	0.8
K	578.52	5264[3]	53,890	4.1	948.2	947.6	0.6
L	579.49	4575[3]	56,157	3.9	949.8	949.5	0.3
M	580.10	4437[3]	59,495	3.7	950.7	950.4	0.3
N	580.88	4582[3]	56,454	3.9	951.5	951.0	0.5
O	581.96	4528[3]	55,525	4.0	952.9	952.0	0.9
P	582.85	3577[3]	49,742	4.4	954.3	953.5	0.8
Q	583.28	5611[3]	69,751	3.2	955.0	954.1	0.9
R	584.03	9242[3]	113,002	1.9	955.5	954.7	0.8
S	584.41	8967[3]	103,975	2.1	955.6	955.1	0.5
T	584.73	8344[3]	93,043	2.4	955.8	955.3	0.5
U	585.12	8761[3]	97,792	2.2	955.9	955.4	0.5
V	585.88	7697[3]	85,715	2.6	956.3	955.7	0.6
W	586.99	4364[3]	53,462	4.1	957.2	956.7	0.5
X	587.92	5465[3]	51,061	4.3	958.2	957.3	0.9
Y	588.66	4170	42,138	5.2	958.9	958.2	0.7

[1]MILES ABOVE MOUTH
[2]THIS WIDTH IS BEYOND COUNTY BOUNDARY
[3]THIS WIDTH EXTENDS BEYOND STATE BOUNDARY

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TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF CASS, NE
(UNINCORPORATED AREAS)

FLOODWAY DATA

MISSOURI RIVER

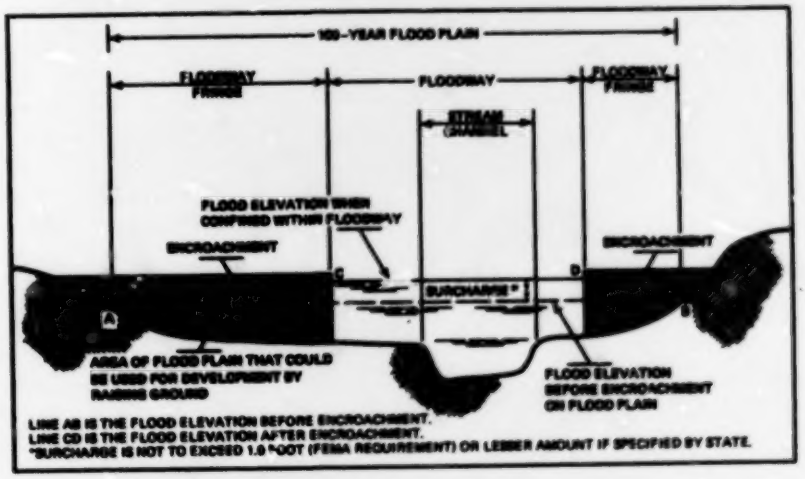
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM (CHANNEL)
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FIGURE 2 - Floodway Schematic

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, FEMA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHF), and flood insurance zone designations for each flooding source affecting the unincorporated areas of Cass County.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the unincorporated areas of Cass County are shown on the Flood Profiles and are summarized in the Flood Insurance Zone Data Table (Table 3).

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5.2 Flood Hazard Factors

The FHF is used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire unincorporated areas of Cass County were divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations are shown or FHFs determined.
Zones A5, A7:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations are shown, and zones subdivided according to FHF.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; or areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

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Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the unincorporated areas of Cass County is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by FEMA.

6.0 OTHER STUDIES

Flood Insurance Studies for Sarpy County, Weeping Water, Avoca, Murray, Cedar Creek and Union agree with this Flood Insurance Study (References 2, 17, 18, 19, 20 and 21). This study and the Plattsmouth Flood Insurance Study differ only in zone determination on the Platte River due to the longer reach in this study (Reference 22).

In 1975, the Nebraska Natural Resources Commission published the report Flood Plain Study, Platte River, Missouri River to Louisville, Nebraska (Reference 6). This study determined the 100-year flood boundary and the floodway boundary for the Platte River. The differences between the Natural Resources Commission study and the Platte River Flood Insurance Studies are updating of the hydrology and modifications of the floodway boundary.

The COE, Omaha District, has conducted a Special Flood Hazard Information Study on the Missouri River. Results pertaining to Cass County were published in Special Flood Hazard Information (Reference 5). These results were adopted for the Cass County Flood Insurance Study.

A Flood Hazard Boundary Map has been published for the community (Reference 15). The differences between the Flood Hazard Boundary Map and this study are justified due to the more detailed nature of this Flood Insurance Study.

This report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the National Flood Insurance Program.

7.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, 911 Walnut Street, Kansas City, Missouri 64106.

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FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
PLATTE RIVER							
REACH 1	0025,0075,0125	–3.6	–1.1	2.9	035	A7	VARIES–SEE MAP
REACH 2	0075,0125	–3.3	–0.9	2.5	035	A7	VARIES–SEE MAP
REACH 3	0125,0175	–3.6	–1.1	2.9	035	A7	VARIES–SEE MAP
MISSOURI RIVER							
REACH 1	0025,0050	–2.6	–0.9	1.6	025	A5	VARIES–SEE MAP
REACH 2	0025	–3.3	–1.1	2.2	035	A7	VARIES–SEE MAP

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF CASS, NE
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

MISSOURI RIVER - PLATTE RIVER

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8.0 REFERENCES AND BIBLIOGRAPHY

1. U.S. Department of Commerce, Bureau of the Census, 1970, Census of Population, Number of Inhabitants, Nebraska, Washington, D.C., 1978.

2. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Unincorporated Areas of Sarpy County, Nebraska, (in progress).

3. Missouri River Basin Commission, Platte River Basin, Nebraska, Level B Study, Hydrology and Hydraulics, Technical Paper, November 1975.

4. U.S. Geological Survey, Water Supply Paper 1680, Magnitude and Frequency of Floods in the United States, Part 6-B, Missouri River Basin Below Sioux City, Iowa, H. F. Matthai, 1968.

5. U.S. Army Corps of Engineers, Omaha District, Special Flood Hazard Information Study Missouri River, Gavins Point Dam to Rulo, Nebraska, Volume I, River Miles 659.4-581.3, October 1977, and Volume III, River Miles 581.8-498.0, September 1979.

6. _____, Missouri River Agricultural Levee Restudy Program, Hydrology Report, March 1962.

7. Nebraska Natural Resources Commission, Flood Plain Study, Platte River - Missouri River to Louisville, Nebraska, Kirkham, Michael and Associates, November 1975.

8. Hoskins-Western-Sonderegger, Inc., Lincoln, Nebraska, Aerial Photography, Scale 1:4800, Platte River, 1976.

9. _____, Aerial Photography, Scale 1:4800, Missouri River, 1973 and February 1974.

10. Nebraska Natural Resources Commission, Flood Plain Study, Platte River, Missouri River to Louisville, Nebraska, November 1975.

11. U.S. Army Corps of Engineers, 723-02A, HEC-2 Water-Surface Pofiles, User's Manual, October 1973.

12. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 10 feet: Plattsmouth, Nebraska-Iowa, 1969; Codear Creek, Nebraska, 1956; Springfield, Nebraska, 1969; Manley, Nebraska, 1966; and Ashland East, Nebraska, 1968.

13. U.S. Army Corps of Engineers, Topographic Mapping, Scale 1:4800, Contour Interval four feet: Platte River, 1976.

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14. ———————, Topographic Mapping, Scale 1:4800, Contour Interval four feet: Missouri River, 1976.

15. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Unincorporated Areas of Cass County, Nebraska, November 1976.

16. U.S. Army Corps of Engineers, Preliminary Guidelines for Delineation of Floodway Limits on the Missouri River, October 1976.

17. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, City of Weeping Water, Nebraska, December 1977.

18. ———————, Flood Insurance Study, Village of Avoca, Nebraska, May 1978.

19. ———————, Flood Insurance Study, Village of Murray, Nebraska, January 1978.

20. ———————, Flood Insurance Study, Village of Cedar Creek, Nebraska, September 1978.

21. ———————, Flood Insurance Study, Village of Union, Nebraska, April 1978.

22. ———————, Flood Insurance Study, City of Plattsmouth, Nebraska, March 1978.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, Training Document No. 1, Water-Surface Profiles, February 1969.

———————, Hydrologic Engineering Center, Training Document No. 5, Floodway Determination Using Computer Program HEC-2, May 1974.

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9.0 REVISIONS DESCRIPTION (Revised: March 4, 1986)

9.1 Purpose

The purpose of this Flood Insurance Study Revisions Description is to incorporate revised data into this currently effective Flood Insurance Study for the Unincorporated Areas of Cass County, Nebraska. This Revisions Description is intended to provide updated information that aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

9.2 Acknowledgments

The hydrologic and hydraulic analyses for this Revisions Description were obtained from the original Flood Insurance Study for the Unincorporated Areas of Cass County. The Federal Emergency Management Agency (FEMA) reviewed and accepted these data for purposes of this revision.

9.3 Scope

The Cass County Office of Zoning Administrator submitted a revised corporate limits map for the Village of South Bend (Reference 1). The revised corporate limits for the Village of South Bend have been included in this revised Flood Insurance Study for the Unincorporated Areas of Cass County.

9.4 Hydrologic and Hydraulic Analyses

The hydrologic and hydraulic analyses used in the original Flood Insurance Study also apply to this revised Flood Insurance Study for the Unincorporated Areas of Cass County.

9.5 Other Studies

This Flood Insurance Study either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for purposes of the National Flood Insurance Program.

9.6 Location of Data

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, Federal Office Building, Room 300, 911 Walnut Street, Kansas City, Missouri 64106.

9.7 References and Bibliography

1. South Bend, Cass Co., Nebr., T12N R10E, Scale 1" = 200', revised 1969, certified by Francis L. Rotter, L.S. No. 253, Cass County Surveyor.

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10.0 REVISIONS DESCRIPTION (Revised May 19, 1987)

10.1 Purpose

The purpose of this Flood Insurance Study Revisions Description is to incorporate new and revised data into this currently effective Flood Insurance Study for the Unincorporated Areas of Cass County, Nebraska. This Revisions Description is intended to provide updated information that aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

10.2 Acknowledgments

The hydraulic analyses for this Revisions Description were performed by the U.S. Army Corps of Engineers, Omaha District. The Federal Emergency Management Agency (FEMA) reviewed and accepted these data for purposes of this revision.

10.3 Scope

A 2.6 mile reach of the floodway was revised along the Missouri River from upstream of Ervine Creek to just downstream of Rakes Creek.

10.4 Hydrologic and Hydraulic Analyses

The hydraulic analyses were revised because of the certification of the Sanitary and Improvement District (SID) No. 1, Cass County Levee by Johnson-Erickson-O'Brien & Associates. The HEC-2 step-backwater computer program (Reference 1) was modified to include the levee. This resulted in no appreciable change in the base flood elvations.

Peak discharge and Manning's "n" values remained the same.

10.5 Floodways

Floodway computations for the Missouri River were revised as a result of certification of the SID No. 1, Cass County Levee. Cross-section data were modified to include the levee. The floodways were computed on the basis of equal conveyance reduction from each side of the floodplain. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was revised and are presented in Table 2, Floodway Data.

10.6 Location of Data

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, Old Federal Office Building, Room 300, 911 Walnut Street, Kansas City, Missouri 64106.

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10.7 References and Bibliography

1. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles, Generalized Computer Program, Davis, California, April 1984.

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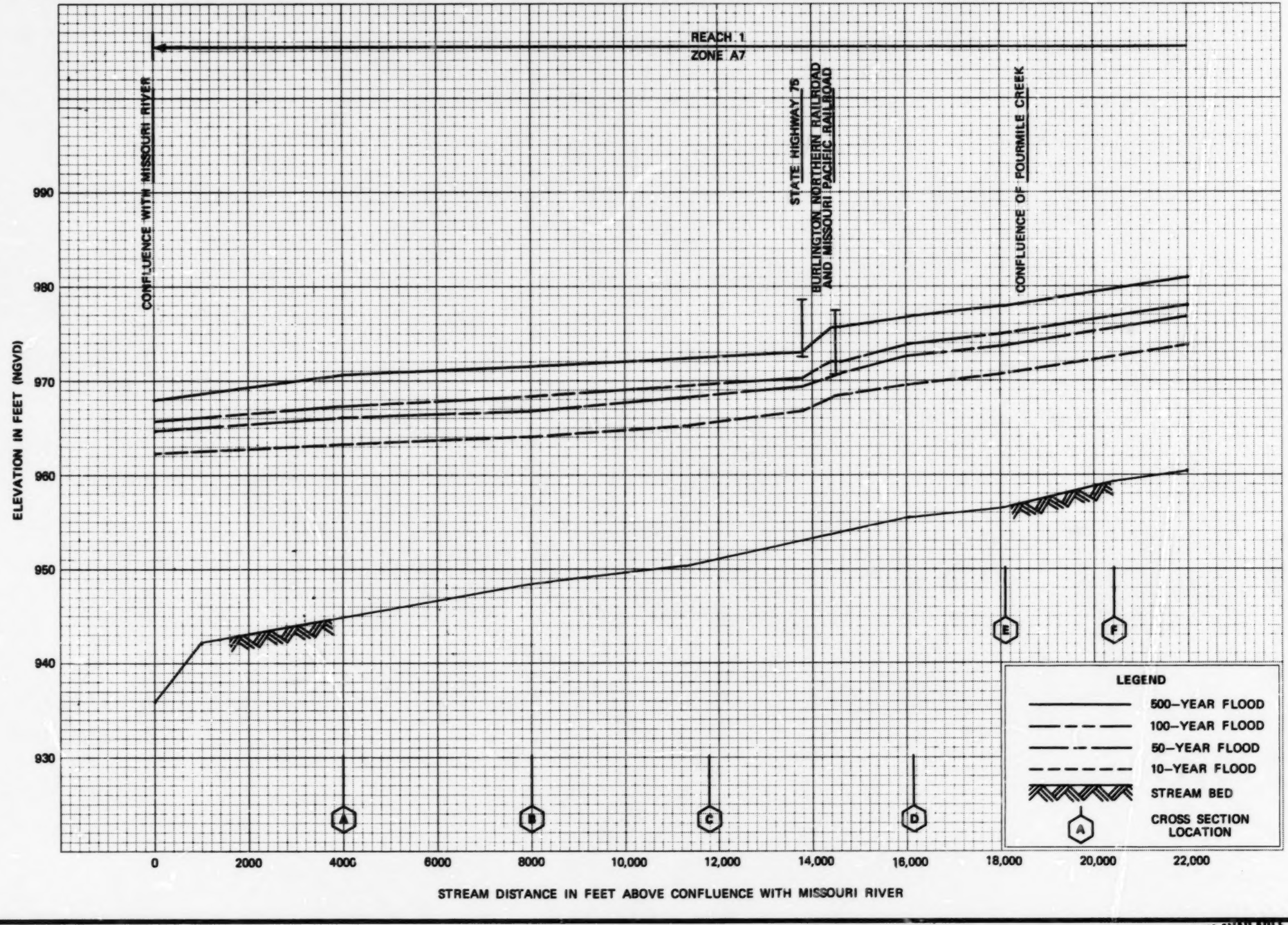

FLOOD PROFILES

PLATTE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF CASS, NE
(UNINCORPORATED AREAS)

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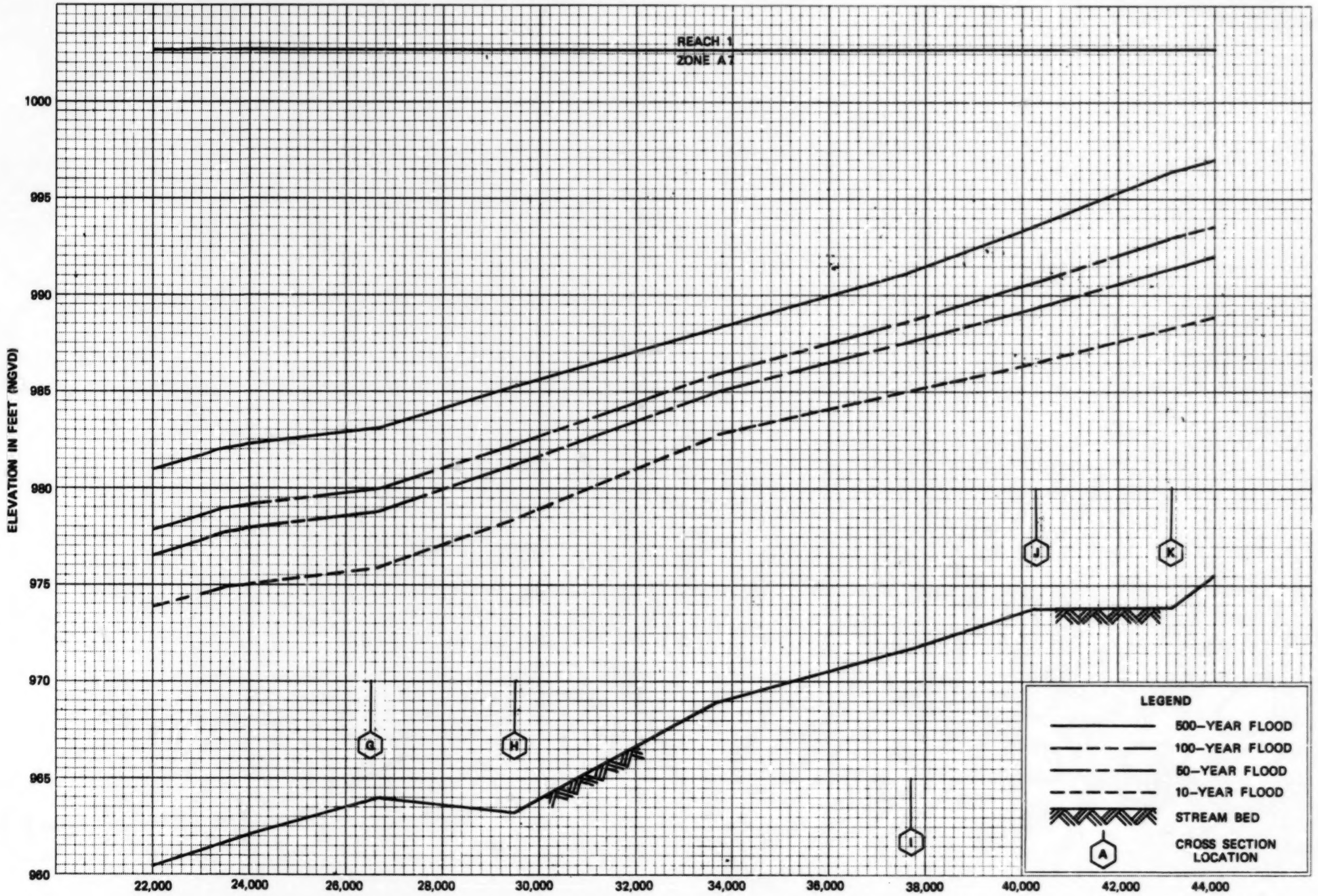

FLOOD PROFILES

PLATTE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF CASS, NE
(UNINCORPORATED AREAS)

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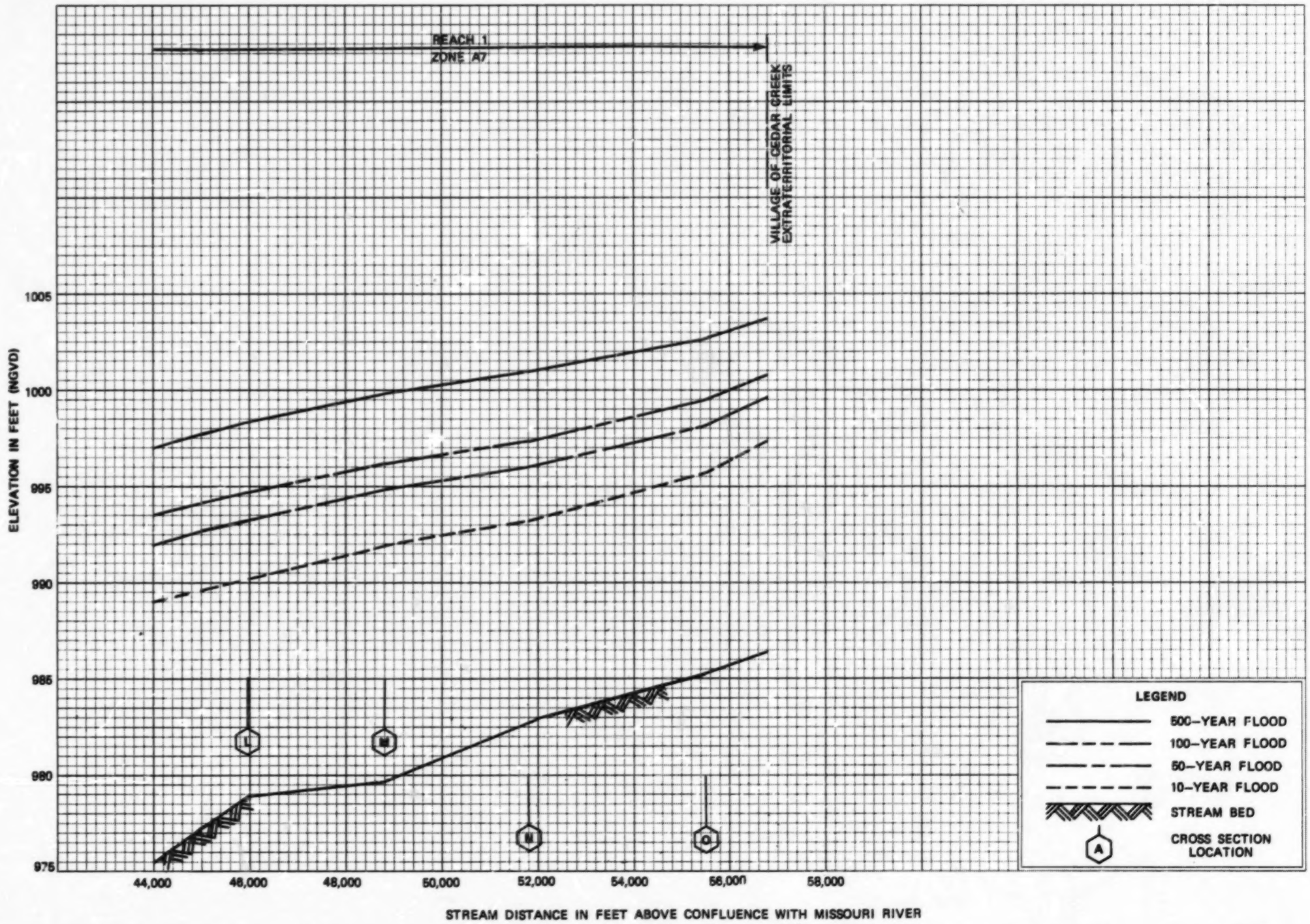

FLOOD PROFILES

PLATTE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF CASS, NE
(UNINCORPORATED AREAS)

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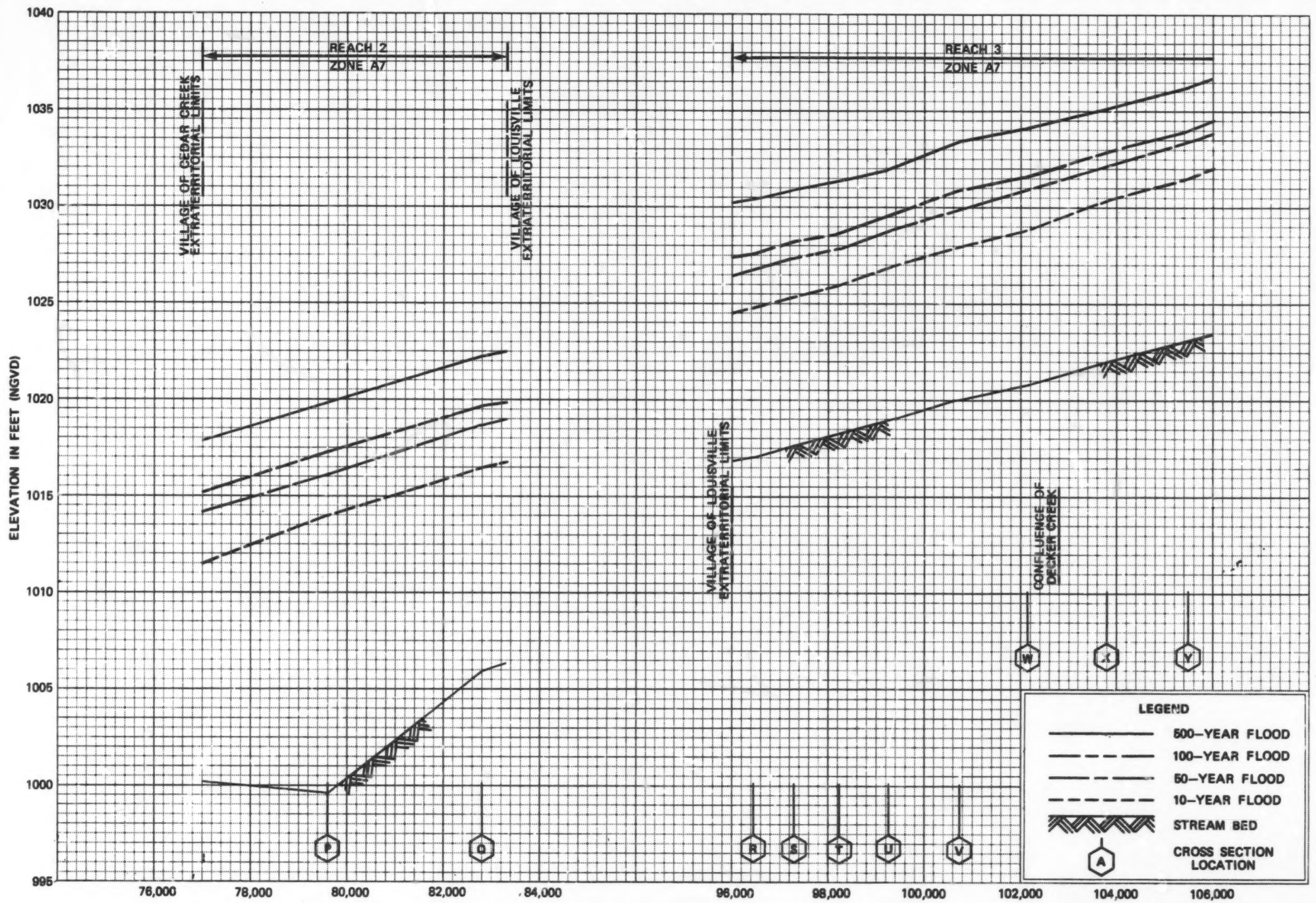

FLOOD PROFILES

PLATTE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF CASS, NE
(UNINCORPORATED AREAS)

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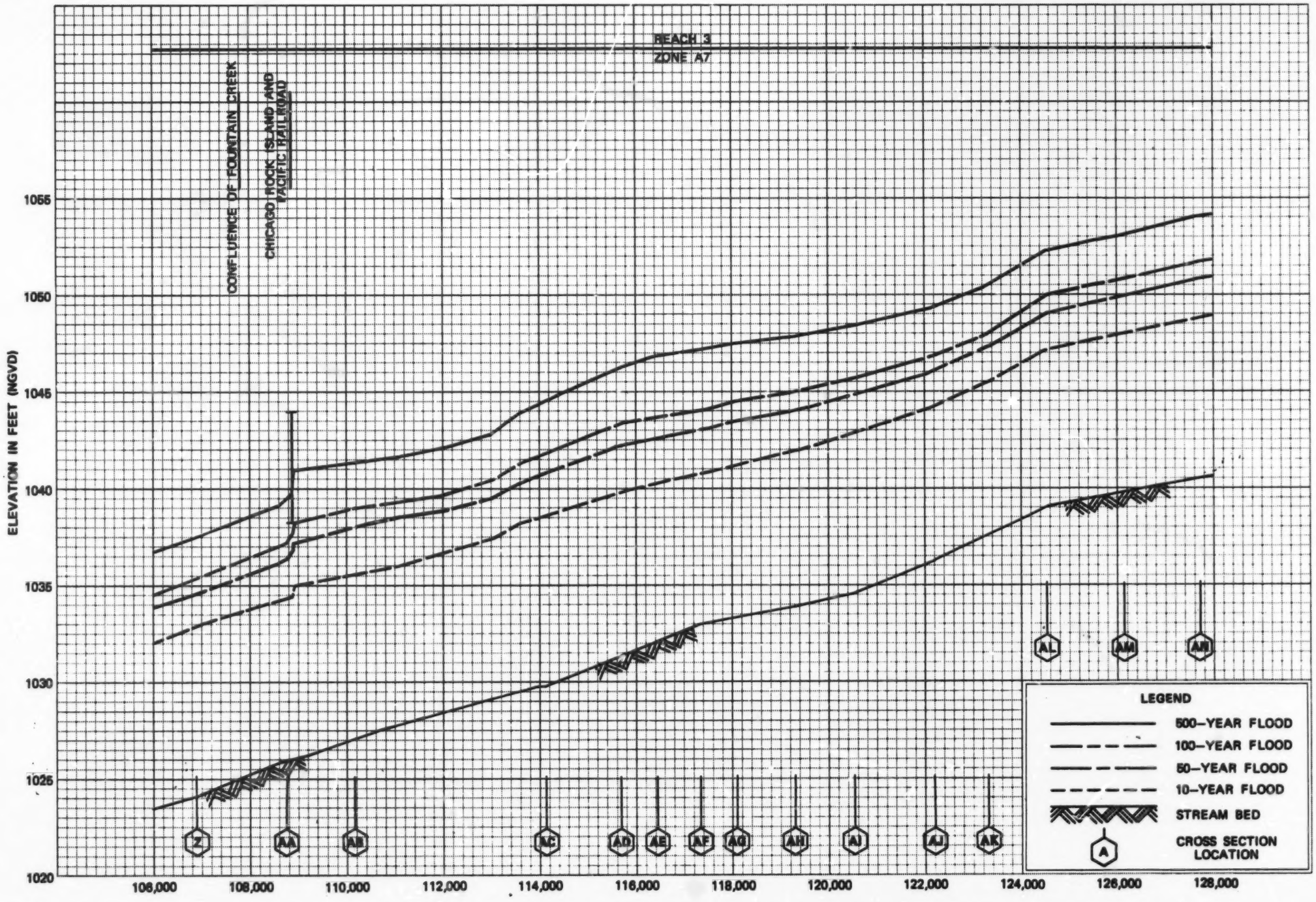

FLOOD PROFILES

PLATTE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF CASS, NE
(UNINCORPORATED AREAS)

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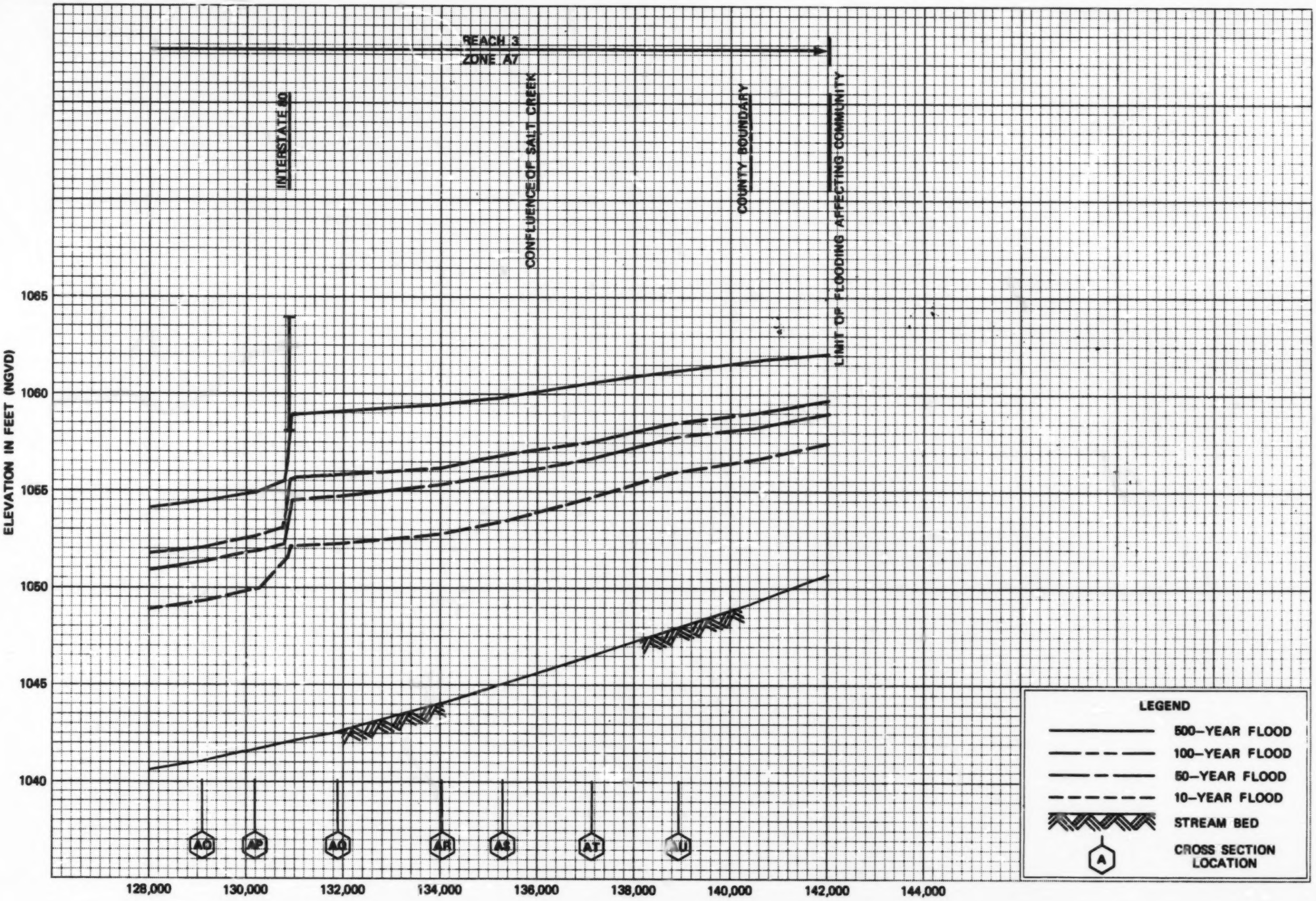

FLOOD PROFILES

PLATTE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF CASS, NE
(UNINCORPORATED AREAS)

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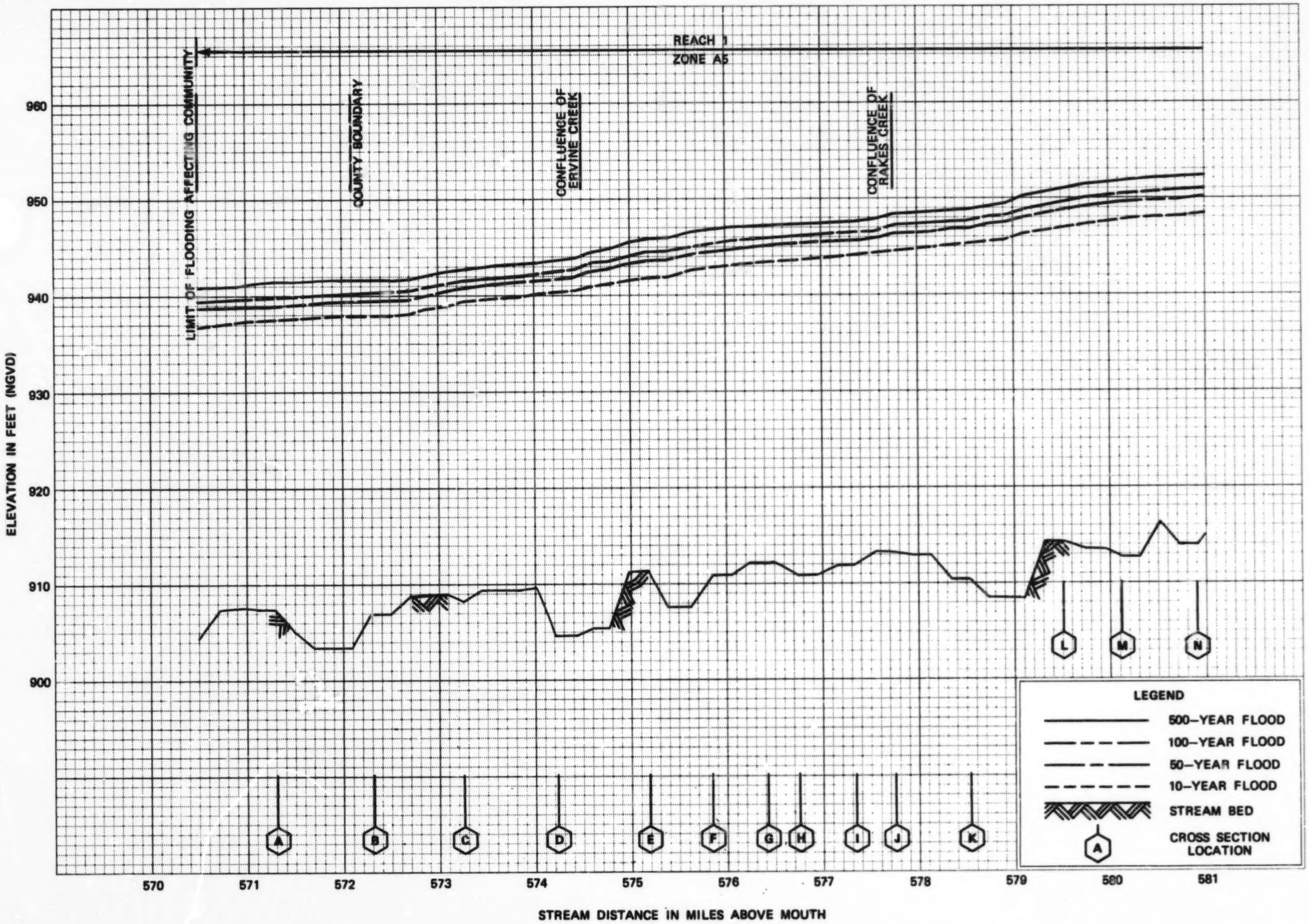

FLOOD PROFILES

MISSOURI RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF CASS, NE
(UNINCORPORATED AREAS)

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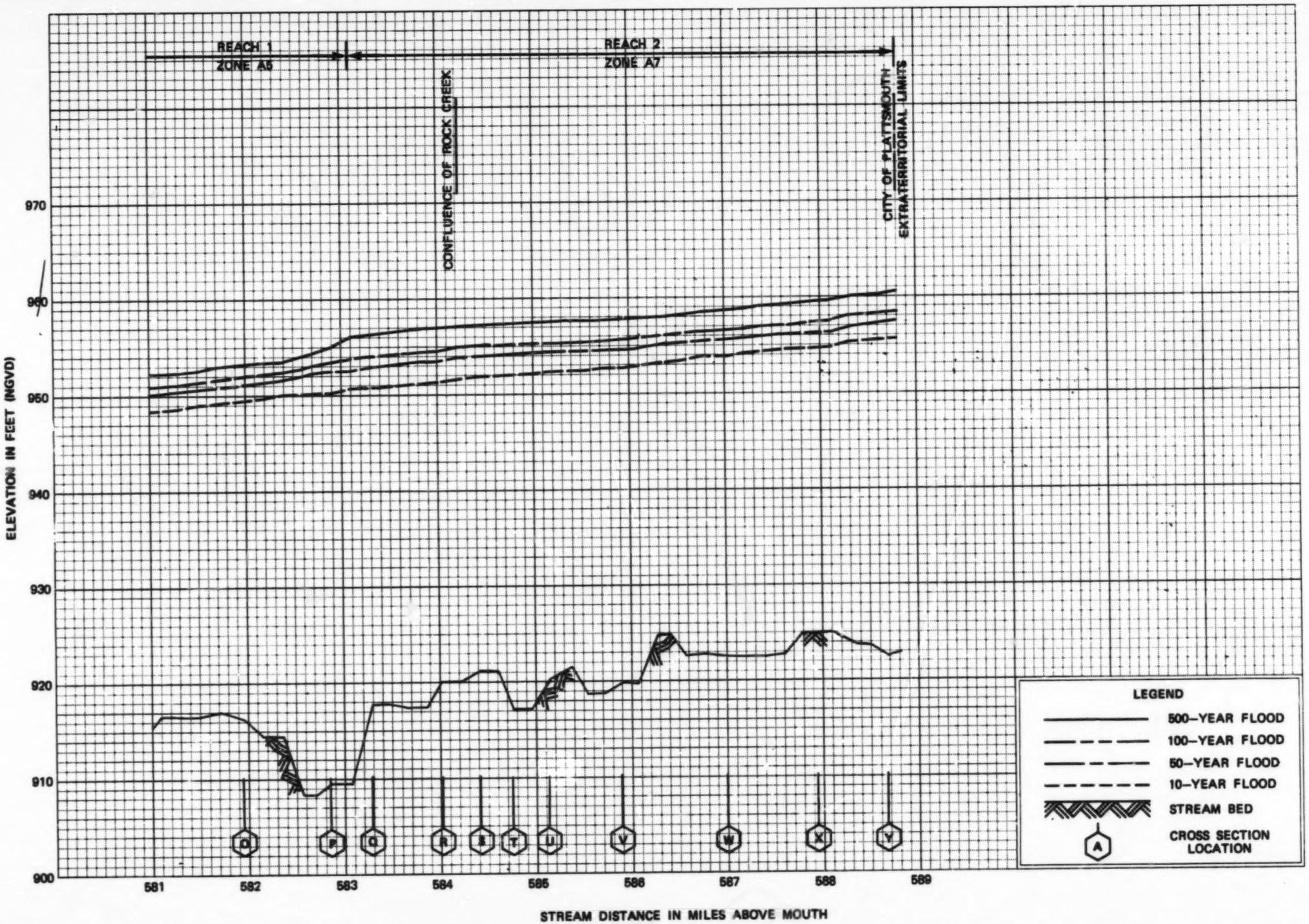

FLOOD PROFILES

MISSOURI RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF CASS, NE
(UNINCORPORATED AREAS)

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